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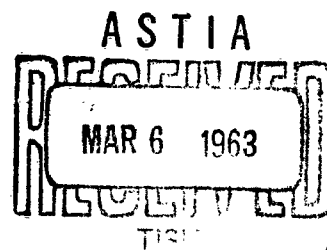
25 January 1963

COMMUNICATIONS NETWORKS

PART I

Review of Soviet Literature

AID Work Assignment No. 33



Aerospace Information Division
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FOREWORD

This is the second report published in response to Work Assignment No. 33 under the title Communications Networks, Part I. Review of Soviet Literature. The first report under this title was published as AID Report 62-92. One report, AID Report 62-93, has been published under the title Communications Networks, Part II. Designations and Abbreviations, and a second report under this title is being issued as AID Report P-63-16.

The topics covered in Part I are as follows:

- I. Communications equipment
- II. Communications facilities and their location

The present report covers both Topics.

TOPIC I. COMMUNICATIONS EQUIPMENT

- 1) Gorshteyn, I. L., and A. V. Sheremetev. Remote servicing of power supplied repeater stations of cable mains. Vestnik svyazi, no. 1, Jan 1961, 5-7.

This system of remote control has been developed for servicing repeater stations of cable mains which are equipped with the K-24 multichannel apparatus for rf telephony. The equipment described is designed to be connected into a symmetrical cable which has no special signal conductor. This remote-control system makes possible the control of the operation of equipment of six unattended repeater stations [HVII], three of which are located on each side of an attended repeater station [OVI]. The system consists of devices for the automatic checking of the working condition of line repeaters of the HVII's and of remote signal system devices [TC]. All faults in the repeaters causing signal loss at the output or reduction of repeating, as well as cases of prolonged (2 to 3 sec) overloading of repeaters, are registered. The TC system accomplishes the transmission of three signals from every HVII into the OVI:

- 1) A fault in the line repeater or partial loss of tube emission;
- 2) opening of HVII door;
- 3) general operating signal of one of the transmitters.

General-signal transmitters check the operating conditions of the equipment and start operating in case of troubles owing to temperature and humidity conditions, a fall in the air pressure in the cable, a sharp change in the magnitude of remote feed voltage in the HVII, and others. TC signals are transmitted along the links between operators (order circuit) in the voice-frequency spectrum (300 to 2400 cps), or jointly along the installations of TC and the order circuit. This eliminates the necessity of separating independent channels of order circuits for remote control and makes possible the use of cables without special signal conductors.

The checking of line repeaters of both directions of transmission is accomplished from one common control generator with a frequency of 400 cps. Indicating signals are transmitted from the HVII's to the OVI by periodically repeated pulses of a three-frequency code. The first frequency in each code determines the number of the HVII, the two remaining frequencies determine the signal number. The pulse receivers, fixed on the OVI, consist of two identical assemblies, each designed for the reception of

indicating signals from three HVII's placed on one side of the OVI. Each assembly consists of a frequency-selective pulse receiver, pulse decoder, signal storing devices, and clamping circuits; they have a common signaling device. The pulse receiver contains a transistorized group amplifier designed for current amplification in six frequencies in the range from 700 to 2350 cps and a selector device composed of six frequency selectors, each built on a trigger circuit using two thyratrons and a polarized relay. The power of the equipment installed on the HVII's totals approximately 5 w at rest and 7 w when transmitting. Power consumed by the equipment installed on the OVI's totals about 15 w, both at rest and in operation.

The equipment is mounted on two base plates, 644 mm x 328 mm x 200 mm for the OVI and 644 mm x 268 mm x 200 mm for the HVII. The entire installation is produced at one of the plants of the Communications Ministry of the USSR.

- 2) Popova, N. E., and I. P. Petrushin. V-60-S type hf telephone terminal equipment. Vestnik svyazi, no. 9, Sep 1961, 11-13.

In addition to the K-60 type Soviet-made system, V-60-S type terminal equipment supplied by East Germany has been used for establishing 60-channel hf telephone communication service on both radio relay (microwave) and cable lines. Since certain technical parameters and principles of operation of this type of equipment used in Soviet long distance service differ from those of equipment in European countries, the following changes and modifications were introduced in the V-60-S equipment. In the channel transition points and in the channel group and supergroup transition points, level settings similar to those accepted for Soviet networks are specified. Transmission-level control is introduced in groups and supergroups as well as in the line spectrum on pilot frequencies used in the USSR (16, 112, and 248 kc). Automatic amplification control is introduced in the channel groups (+ 0.4 neper). A line equalizer with an attenuation of 0.15 to 0.25 neper at 252 kc is introduced into the receiving channel of the system. The voice-frequency selective ringing equipment is changed, i.e., 2100 or 2280 c is used for ringing purposes within the channel frequency band.

The V-60-S is designed for radio-relay terminals when the long distance (toll) office and the terminal are located in the same building or when they are located separately with a switching trunk between them. It may also be used for setting up not only 60-channel multiplexing radio-relay lines but also for lines of higher capacity. In this case, special equipment of Soviet manufacture should be installed to form the total radio-trunk spectrum from the frequency spectra of several 60-channel groups. The V-60-S equipment can be used in the terminals of relatively short

symmetrical cable main lines. It is designed for operation of a 2-cable, 4-wire system. For this reason, the same frequency spectrum (12-252 kc) is used for both directions of transmission. Channel equipment and af devices are transistorized and printed circuits are used. The af channel is terminated in a differentiating network and a converter for sending and receiving ac or dc ringing signals. The receivers of voice frequency ringing-dialing signals may also be used for an automatic switching system. Frequency conversion is based on multiple group modulation. To form the frequency spectrum of the primary 12-channel group, preliminary modulation of a 3-channel group is applied. All the carrier frequencies are multiples of 4 kc and one supplied by a single master oscillator. Output power of the oscillator set is designed for supplying 4 V-60-S terminals. Simultaneous operation of 2 broadcasting, 2 phototelegraph, 15 voice-frequency telegraph channels, and 39 telephone channels is provided for this system. The line amplifiers and equalizers of the terminal insure attenuation compensation of the adjacent cable section with a length spread from 8 to 21 km. The psychometric noise level (power) introduced into transmitting and receiving channels by the terminal is 600 picowatts at the load of the system; this is in agreement with the recommendations of the International Consultative Committee on Telegraphy and Telephony. The "S" letter in the trade mark of the equipment means "for the Soviet Union."

- 3) Vorontsov, A. F. To improve radically rural telephone service. Vestnik svyazi, no. 3, Mar 1962, 16-17.

The rayon telephone service of the RSFSR still falls far short of meeting in full the needs of agricultural production and of the rural population. In many cases, the quality of communication is unsatisfactory owing to low quality equipment and poor installation practices. In particular, in the rayon communications networks, there are still 25,000 one-wire lines and in 136,000 lines, many telephone sets are operating in parallel. In the rural areas of the RSFSR, including rayon administrative centers (RAC), the MB and UB manual switchboards are still used. To cite an example, in Stavropol'skiy kray only 33 of 284 telephone exchanges serving the rayon are of the automatic type. The remainder are of the manual switchboard type. In the RAC of the territory the situation is no better. There is a considerable active stock of the UB common-battery exchanges, but in many cases the equipment is so worn that replacements are needed. In 1960, important decisions were taken on the development of rural telephone communication. This meant a radical improvement of the service. By 1965, reliable telephone communications are to be organized between all the rural councils, state and collective farm managements, and RAC's. The establishment of management telephone intracommunication systems is planned for all state farms and for 25% of the collective

farms. A reconstruction of the working rayon telephone network has also been ordered. The extent of this work is evident from the following figures. Management telephone intracomunication systems will be installed in 4000 state farms and in more than 6000 collective farms; this will require automatic telephone exchanges with a total capacity of 364,000 numbers. For the reconstruction of the rayon telephone system, including RAC's, it is planned to replace manual telephone exchanges with automatic ones with a total capacity of more than 500,000 numbers. In order to bring the existing rayon telephone network into proper technical conditions, it is necessary to replace 25,000 one-wire telephone circuits with two-wire circuits, to unload 120,000 km of subscribers' circuits (by removing parallel-connected telephone sets) and 16,000 km of trunks, and to install 83,000 km of additional lines for telephone exchanges. To accomplish this work, 86,000 tons of galvanized steel wire and more than 800,000 km of various cables will be required. In addition, it is necessary to install 10,000 sets of hf multiplexing equipment and 225 sets of radio relay line equipment. It is possible to sum up the steps taken toward its realization and to state the shortcomings existing as of March 1962 as follows:

- 1) The organization of telephone communications between the rural councils, state farms, collective farms, and the RAC's is being carried out successfully.
- 2) The plan of organizing management telephone intracomunication systems in state and collective farms has not been implemented.
- 3) The amount of work accomplished in the reconstruction of the active rayon telephone networks is wholly inadequate.
- 4) The construction of automatic telephone exchanges for rayon communications as well as of management telephone intracomunications for state and collective farms did not attain the projected volume.

The latter failure was especially noticeable in the Moscow, Voronezh, and Orel Oblasts and in the Stavropol'skiy, Krasnodarskiy, and Altayskiy krais, where the amount of work necessary to provide each farm with telephone facilities is frequently not determined by the needs of production, but by the financial resources of the agricultural enterprise itself. In addition, such technical factors as the multiplexing of trunks and the suspension of auxiliary circuits have been neglected. As the first step in eliminating these essential shortcomings, the problem of financing the purchasing of the multiplexing equipment in the required quantities should be solved. This might be

accomplished by concentrating those financial resources of the state farms which are utilized for telephone communication in the Ministry of State Farms, RSFSR, which in turn would grant allotments to territory and oblast' administrations for the purpose of telephone communication construction. In the rayon telephone network, the basic increase in trunks will be obtained by installation of hf multiplexing equipment. For 1961, a serial production of 1000 sets of the "Oktava" multiplexing equipment was ordered, but the experimental models of this much-needed equipment were not approved until March 1962. A policy concerning the development of rural telephone communication should include the use of simplified and cheaper telephone equipment. It is urgently necessary that the Ministry of Communications, USSR, and the Ministry of Agriculture, USSR, jointly with the Main Power Administration, the Ministry for Construction of Power Stations, and the State Committee for Radioelectronics should accelerate scientific investigation and experiments on utilizing power transmission lines for general telephone service and for management telephone intracommunications at state and collective farms. This could be helpful in reducing the time required for completion of rural telephone development.

The introduction of automatic telephone systems into rural service is considerably hampered by delayed deliveries of equipment. For example, in 1961 Bashkir and Latvian state farms cancelled the delivery of automatic exchanges. For similar reasons, in the Voronezh, Kaliningrad, Kurgansk, Novgorod, Rostov, and several other oblasts, it is still impossible to put telephone service of state and collective farms into operation although the expensive line installations are already completed. In the Krasnodarskiy kray and in the Orel, Voronezh, and other oblasts, this problem was solved by installing MB local-battery switchboards instead of automatic exchanges.

The transfer of rayon communication lines to the line technical centers has resulted in considerable improvement in the quality of maintenance and servicing. Taking into consideration the development of line establishments and installations, the efficiency of line technical centers should be increased by better mechanization and transportation as well as by improving the proficiency of the personnel, so that the technical and operating conditions of the lines can be maintained on the previous faultless level.

- 4) Berezovich, L. A. The AMCO-60-Y, a modified intercity semiautomatic communication equipment for intraoblast networks. Vestnik svyazi, no. 4, Apr 1962, 5-7.

The modified version of the AMCO-60-Y single-frequency (2100 cps or 1600 cps) equipment for oblast-wide communication has been in production since 1961. The modification consists in the following: the signal code is changed; the outgoing distribution frame of the long-distance switchboard ИСК-М-49 and the voice-frequency ringer terminal frame ИКТНОУ are combined to form the voice-frequency ringer terminal frame ИКТНУ; a bilateral matching unit, designed to serve as an intermediate unit for output to the long-distance switchboard as well as for automatic oblast-wide through-traffic, is introduced; new sets of trunk relays for automatic direct distance dialing (РСДЯ) are designed for operation without the recording of the call. The AMCO-60-Y allows two-way operation of the channel, semiautomatically to either oblast or to long-distance exchanges, and manually to intrarayon exchanges. It uses the single-frequency method for transmitting the control signal. An af oscillator with a frequency of either 2100 or 1600 cps is used as the control-signal source and the ПТНОУ, as the control-signal receiver.

Receiving equipment can operate with ATC-47 and ATC-54. The voice-frequency dialing unit of the outgoing equipment operates only with long-distance switchboards of the М-49, М-60, and ЦБ-НКС types. For normal operation, power-supply voltage must be 21 to 27 v and 58 to 64 v and speed of dialing must be 9 to 11 pulses/sec at a pulse ratio of 1.3 to 1.9.

- 5) Sul'g, P. A. The 3-3P and 3-7P automatic diesel-generator power-supply units for rediffusion stations. Vestnik svyazi, no. 4, Apr 1962, 10-12.

Recently Soviet industry began producing the automatic diesel-generator power supply units ДГА-6, ДГА-12, ДГА-24, ДГА-48 and ДГА-100 in the 6 to 100-kw power range. These units are very complicated and expensive, and therefore cannot be used in rural rediffusion stations. The comparatively simple and inexpensive 3-3P and 3-7P diesel-generator power-supply units, rated at 3 and 7 kw, respectively, have been designed and put into production by the Riga Diesel-Building Plant. Both units generate three-phase current and are similar in construction. The automatic systems of the units accomplish the following operations:

- 1) Switching of the equipment of the rediffusion station to the local power network;
- 2) Automatic switching of the load from power network to the unit in 75 sec when the voltage of power network drops;

- 3) Automatic switching of the load from the unit to the power network once the voltage is re-stored;
- 4) Preventing damage to the unit from overheating or overloading;
- 5) Starting a second power supply unit;
- 6) Stabilization of unit voltage within $\pm 3\%$;
- 7) Charging the secondary battery, which is used for engine starting and feeding the automatic system apparatus;
- 8) Warming the engine when ambient temperature drops below 8°C ; and
- 9) Counting the hours of unit operation.

- 6) Savanchuk, V. A., and K. A. Alekseyev. Videotelephone. Vestnik svyazi, no. 4, Apr 1962, 13-14.

The Ministry of Communication of the USSR has organized the first videotelephone communication in Europe, between Kiyev, Moscow, and Leningrad. The experimental operation shows that the new type of communication medium is very popular. Presently, the telebroadcasting coaxial cables are used for videotelephony when no television programs are being transmitted. The videotelephone call office has three rooms: a 12 to 15 m² instrument room, a 12 to 25 m² studio, and a waiting room. Two ПТВ-2М industrial television units are used for receiving and transmitting the image, one being used as an emergency unit. The ПТВ-2М unit consists of: the КТ-29 television camera, the ОП-3 optical head, the УВ-19 channel block and БКП-48 video-control unit for control of local transmission. The "Rubin-102" television receiver is used for control of input signal. The videotelephone equipment in this facility operates stably and a single technician services the entire installation.

- 7) Dobrovol'skiy, V. V., and Ya. L. Khaykin. Radio transceiver for [RR] car checkers. Avtomatika telemekhanika i svyaz', no. 5, 1962, 7-12.

The КР-4П (О2Р2) transceiver, which was used by RR car checkers, has been dropped from production, owing to the following faults: short range (1.5 km), less than 8 hrs power supply, large frequency drift during temperature changes, and insufficient volume. In the end of 1961 the industry began producing a new 24Р1 portable fm transceiver to replace the КР-4П. The 24Р1 is a push-to-talk device operating in the 33 to 46 mc band.

It has crystal frequency stabilization and voice-frequency ringing. The range of this transceiver under any weather conditions is over 2 km when the communication is carried out with a similar transceiver and 3 to 4 km with stationary KP-4П-type station at the other end. Two KHP-4 nickel-cadmium secondary cells, less than 3 kg in weight, provide power for continuous 8-hr operation at a 12:1 reception-to-transmission ratio. Current consumption at 2.4 v is 0.8 amp for reception and 2 amp for transmission. The transceiver is designed for operation in the 50 to 40°C range, but the capacity of the storage batteries decreases at low temperatures. The Kulov rod-antenna (the same as that of the KP-4П transceiver) with a counterpoise 1.5 m in length is used in the 24P1 transceiver. The super-heterodyne receiver, with 2-μv sensitivity at a 5:1 signal-to-noise ratio, has two rf stages designed for operation with the TA-56 earphone set. The transmitter has a crystal master oscillator (which serves as the crystal heterodyne for the receiver) parametric oscillator with two 103 diodes for frequency modulation, two-stage voltage amplifier, power amplifier, microphone amplifier and two-transistor tone-generator. The power output of a dummy antenna is 0.3 w. The d-c inverter for high voltage supply has a 3-kc transistor blocking-oscillator and a diode rectifier. The overall dimensions of the transceiver are 210 x 105 x 180 mm.

- 8) The ABYД-2 apparatus for remote switching of street loudspeakers. Vestnik svyazi, no. 5, May 1962, inside front cover.

The Central Design Office of the Ministry of Communication has designed the ABYД-2 apparatus for remote switching of street loudspeakers to the wire broadcasting network. The apparatus consists of two blocks: the ABYД-2K block, 16 kg in weight, with overall dimensions of 530 x 242 x 265 mm which is placed in the rediffusion station for sending the 5000 cps control signal to the ABYД-2M block, placed near loudspeaker for switching the loudspeaker. The ABYД-2M weighs 44 kg and has overall dimensions of 142 x 160 x 290 mm. The total power consumption of the apparatus is 85 w.

- 9) Artyushin, N. K., and G. Ya. Suvorov. Installation and adjustment of the PM-24A radio relay line. Vestnik svyazi, no. 5, May 1962, 6-8.

The PM-24/A radio relay system serves 22 commercial channels, one service channel, and one channel for end synchronization. Pulse-phase modulation is used. The range of transmission without repeaters is up to 100 km; four repeaters can be used in this system. Frequency range is 1900 to 2100 mc. The antenna is parabolic, 4 m² in area, with 28 db. amplification, a beamwidth of $\pm 3^\circ$,

input resistance of 50 ohm, and output power of 10 w. Either coaxial cable with polyethylene insulation and 0.7 db/m attenuation or rigid coaxial cable with air insulation and 0.1 db/m can be used as the antenna feeder. The maximum power consumption is 2.5 kw at 380/220 v.

- 10) Vdovichenko, A. A. Qualities and shortcomings of the new ABK-1 apparatus for wire-broadcasting output commutation. Vestnik svyazi, no. 7, Jul 1961, 14.

The ABK-1 apparatus is designed for distributing the output power from three TV-5 af amplifiers between 10 distribution feeders, two feeders for street broadcasting, two rural-type high-voltage feeders and two derived-channel equipment bays. The main advantage of the ABK-1 apparatus lies in the fact that the input resistance, attenuation, and insulation of each feeder can be measured at any time without disconnecting it. The experimental lot of the apparatus had several shortcomings in the control circuit for feeder measurement which were discovered by L'vov central amplifier station.

- 11) Machlejd, J. Coaxial cable of the Ożarów Cable Works im. M. Buczka. Wiadomości elektrotechniczne, no. 5, 1962, 159-161.

In response to a request received in 1960, the Ożarów Cable Works has developed the TKDWF coaxial cable (4 x 2.6/9.5 + 5 x 4 x 0.9) for the K-1920 multiplexing system. Hard copper wire 2.64 mm in diameter is used as the inner conductor of the coaxial pair and is insulated by polyethylene washers 1.7 mm thick spaced 28.3 mm apart. The outer conductor consists of a single 0.25-mm copper tape formed into a tubular conductor, which is in turn tightly wrapped with two soft steel tapes, the outer one covering the gaps between the turns of the inner tape. All coaxial pairs are insulated with paper tape. The twisted central balance quad pair cable is made from 0.9-mm enameled copper wire and has fiber-reinforced paper insulation. The other four quads are similar, except that bare copper wire is used. The whole cable core is insulated by paper tape and covered by a lead sheath containing antimony. Several types of covers are in production:

nonarmored	TKDW
armored by steel tape	TKDWF+A
armored by round-wire	TKDWFoA
armored by flat-wire	TKDWFpA

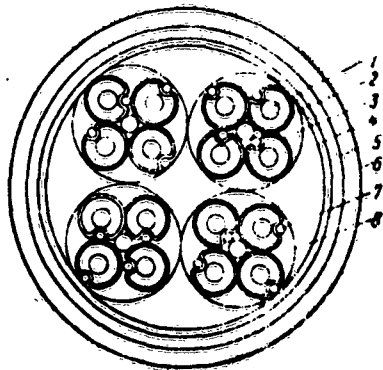
The parameters of the coaxial pairs are as follows:

1) Maximum d-c resistance of inner conductor	3.5 ohm/km
2) Minimum insulation resistance between pairs	10^4 Mohm/km
3) Resistance at 2.5 mc	75 ± 0.5 ohm
4) Resistance between other conductors	700 Mohm/km
5) Attenuation at 2.5 mc	460 neper/km
6) Crosstalk attenuation of factory-length (220 m) at 300 kc	16 neper.
7) Testing voltage for coaxial pair	3700 v (d-c) during 2 min

The factory was set in operation 3 years ago.

- 12) Grodnev, I. I., K. A. Lyubimov, K. V. Sidorov, and A. P. Sverkalova. Balanced hf communication cables with new insulation. Vestnik svyazi, no. 6, Jun 1962, 7-9.

The Scientific Research Institute of the Cable Industry, together with the Moskabel' Plant, has designed the MKIIA 4 x 4 x 1.2 balanced toll cable with "balloon"-type polyethylene insulation. The insulation is a pipe 3.25 mm in diameter and 0.2 mm thick placed coaxially with a copper conductor 1.2 mm in diameter in such a way as to form an air gap between the pipe and the conductor. To fix the conductor in the center of the polyethylene pipe, a polyethylene cord is wound spirally around it. The cord presses the pipe against the conductor along the spiral, creating a rigid system. The illustration shows a cross section of the cable. The cable can have a lead, aluminum, or plastic sheath. Experimental MKIIA cable was manufactured by the Moskabel'



1 - 1.2 mm copper wire; 2 - 0.8 mm styroflex cord; 3 - Polyethylene pipe; 4 - Four layers of paper tape; 5 - air gap; 6 - 1.75-mm aluminum sheath; 7 - 0.8-mm polyethylene cord; 8 - Cotton-thread wrapping.

plant and tested successfully. The tests showed that this cable can be used as a toll cable(s) with the K-60 multiplexing system in a frequency range of up to 250 mc. The other data for 290 m lengths of the cable are:

- 1) Insulation resistance - 15,950 Mohm/km;
- 2) Operating capacity - 24.5 nanofarads;
- 3) Insulation electric strength > 10,000 v.

At present the production of this cable is being organized in several factories.

- 13) Abdulin, A. News of long-distance communications. Nauka 1 zhyttya, no. 7, 1962, 38-39.

Thousands of the Moscow telephone subscribers can dial directly any dial telephone subscriber in Leningrad or Kalinin by dialing four figures (91-91 for Leningrad and 91-92 for Kalinin), then the number of the subscriber, and finally the caller's own telephone number. Demand time is automatically registered. In the near future direct distance dialing will be possible between Moscow and Kiyev, Khar'kov, and Gorkiy, as well as cities in Latvia, Estonia, and Lithuania. The unique semi-automatic "Tesla MH-60" system for international communication has been designed by scientists of the USSR, Czechoslovakia, East Germany, and Hungary. The Tesla Plant (Czechoslovakia) has begun to produce this equipment in quantity for all countries of the socialist bloc, including the USSR. The MH-60 system equipped with additional apparatus makes it possible to call automatically any telephone subscriber in a foreign country by dialing 13 figures.

- 14) Voice-frequency semiconductor telegraph equipment. Vestnik svyazi, no. 7, Jul 1962, inside front cover.

A commercial-type 17-channel voice-frequency telegraph system with frequency modulation has been designed. The system can be used to achieve six, twelve, or seventeen duplex communication links by using a single four-wire, 300-3400 cps telephone channel. It may also find application in radio relay communications lines designed for secondary multiplexing. The circuits of this system are based entirely on semiconductor devices. All equipment is mounted in one bay with overall dimensions of 2600 x 650 x 280 mm and a total weight of 240 kg.

- 15) Bangaytis, V. K., and R. M. Stetsevich. Experience in building a PM-24/A radio relay link in Lithuanian SSR. Vestnik svyazi, no. 7, 1962, 15-16.

In 1959 the Ministry of Communications of the Lithuanian SSR obtained the PM-24/A radio relay system, manufactured by Budavox of Hungary. This system operates in the 1900 to 2100-mc frequency range and insures simultaneous transmission of 22 telephone conversations. Pulse-phase modulation is accomplished through the use of synchronizing, channel, and order pulses driving the turbator-type shf transmitter. The signal-to-noise ratio in a channel with one repeater is 42 db. The PM-24/A system has an automatic 3-kw power supply unit and a set of reference and measuring instruments. A radio-relay link equipped with this system was built between Vil'nyus and Kaunas. Existing television towers (100 m high in Vil'nyus) were used for mounting the end antennas of the radio-relay link, and a brick tower was built for the repeater. Coaxial cable of the PKK-5/18 type, with attenuation of 13 neper/km, was used for the antenna feeders at the terminal stations (130 m in length in Vil'nyus and 70 m in Kaunas). The PM-24 rigid feeder (a Hungarian product) was used on the repeater station where feeder links do not exceed 9 m. The experimental operation of this link since April, 1961, shows that it is reliable, it satisfies the requirement of telephone communications, and it can be recommended for wide use in Republic-wide links.

- 16) Kokoshkin, P. A., and L. S. Golubev. Novyye avtomatizirovannyye vypryamitel'nyye ustroystva dlya elektropitaniya apparatury provodnoy svyazi. Informatsionnyy sbornik (New automated rectifier devices for supplying electric power for wire-communication equipment. Reference collection). Series: Tekhnika svyazi. Moskva, Svyaz'izdat, 1960, 3-8.

Selenium rectifiers of the BCC-51 type produced by industries of the Ministry of Communications, USSR, have been the basic types of converters used in electrical installations of communications enterprises. However, a series of new automated rectifiers, developed and placed in production by the industries of the Ministry, will replace the BCC-type rectifiers in all communications installations.

A new series consists of five groups with rated power of 1, 2, 4, 8, and 16 kw. Each group includes four types of rectifiers:

- 1) for supplying filament circuits of communication equipment with a rated voltage of 24 v;
- 2) for supplying plate circuits (220 v);

3) for supplying automatic telephone (ATC) equipment (60 v); and

4) for supplying LT electric motor circuits (120 v).

All 1- and 2-kw rectifiers, as well as the 4- and 8-kw rectifiers for supplying filament and plate circuits, are designed for trickle-charging operating conditions (i.e., with storage batteries in trickle charging) and can be also used for charging the batteries.

All other types of rectifier devices are designed for operating only in conditions of trickle charging and cannot be used for charging the storage batteries; separate booster rectifiers must be used for that purpose.

For trickle-charging batteries

Basic d-c parameters of the new series of rectifiers

Rectifier designation	Voltage of rectifier in conditions of trickle charging, volts	Max. voltage of rectifier, volts	Power of Rectifier in Kw			
			I	2	4	8
			Maximum Current of Rectifier, amp			
Supplying filament circuits	26-30	36	30	60	120	250
Supplying ATC equipment	58-66	92	11	22	-	-
Supplying motor (LT) circuits	120-140	170	6	11	-	-
Supplying plate circuits	232-265	320	3	6	13	27

Basic d-c Parameters of Floating Rectifiers

Rectifier Designation	Voltage of rec- tifier in condi- tions of trickle charging, volts	Power of Rectifier in kw		
		4	8	16
		Max. current of rectifier, amp		
Supplying ATC equipment	58-66	70	140	260
Supplying LT motor circuits	120-140	33	66	-
Supplying plate circuits	232-265	-	-	60

The new series of automated rectifier devices provides for automatic execution of the following operations:

- a) Protection of rectifiers against overloads and overvoltages;
- b) Automatic switching of the rectifier to a partially charged battery, with current stabilization and transition to voltage stabilization after the rise in voltage to previously given value;
- c) Automatic switching off of the rectifier when voltage of the supply network falls off, and automatic switching on with voltage recovery;
- d) Automatic switching of the rectifier for parallel operation, depending on load;
- e) Automatic switching of standby rectifiers under conditions of current stabilization for charging of batteries;
- f) Remote switching on and off of rectifiers; and
- g) Switching on of an ampere hour meter for automatic maintaining of batteries in charged condition.

The new series of rectifier devices is developed in two variants: 1) using germanium power rectifiers, and 2) using type ABC, 100 x 100-mm selenium rectifiers.

The new devices use the so-called "ballast chokes," which make it possible to maintain stable voltage with changes in load current value of 5 to 100% (instead of 20 to 100% in the BCC series).

All types of the devices are 2250 mm in height and 700 mm deep. Width is determined by rectifier power: 2 kw, 450 mm; 4 kw, 650 mm; 8 kw, 900 mm; and 16 kw, 1200 mm. The rectifier devices are built in the form of a cabinet.

TOPIC II. COMMUNICATIONS FACILITIES AND THEIR LOCATIONS

- 1) Voronov, B. A. An exemplary communications system for greater Moscow. Vestnik svyazi, no. 1, Jan 1961, 3-4.

In connection with the expansion of Greater Moscow and the 1960 decision of the Central Committee of the Communist Party of the Soviet Union and of the government to establish the area of Moscow at 87.5 thousand hectares, the communications system of the city has to be adjusted. In 1960 there were over 60,000 people working in the Moscow communications system. The administration of the Moscow telephone network controlled 30 substations, as well as 176 departmental central telephone offices in territories recently included in the city area and in the surrounding forest-park protective area (comprising 180,000 hectares. The a-f rediffusion network was increased by 450,000 "radio points." However, several districts still have to be included into the telephone service of the new Moscow areas; among the most important are Butyrskiy Khutor, Testovskiy Poselek, Shelepikha, Khovrino, Cheremushki, Yugo-Zapad, and the following inhabited points within the boundaries of the city and of the forest-park area: Vnukovo, Vidnoye, Lytkarino, Chertanovo-Krasnoye, Stroitel', Los', Biryulevo, Setun', Bakovka, Davydково, Lenino-Dachnoye, and several others. It is suggested that in 1961 the city telephone system will be developed by increasing its capacity. The automatic offices ATC-2-3 in the building of the "Ukraine" Hotel and ATC-B-4 on the Serpukhovskiy embankment will be greatly expanded. It is planned to build and put in operation ATC-B-6 in Novyye Cheremushki and E-9 at the Shcherbakovskaya Street. The capacity of the ATC of the town of Kuntsevo will be increased. The utilization of internal reserves will be raised; for example, the use of double-wire connector relays will permit considerable savings of cable. Establishment of twin apparatus (coupled app) will satisfy demand for telephone communication. Over 30 automatic offices with a total capacity of 165,000 numbers will be built; in addition, new ATC's will be established in the towns of Balashikha, Lyubertsy, Reutovo, and Krasnogorsk, and in the settlements of Odintsovo, Perlovskaya, Lenino-Dachnoye, Vagoneremont and Ochakovo.

- 2) Organization and operation of communication facilities.
Vestnik svyazi, no. 1, Jan 1961, 18-19.

This is a survey of letters received by the editors of Vestnik svyazi, in which the authors discuss their experience in introducing automation and mechanization facilities in electric communications systems.

I. I. Vishenskiy [Efficiency expert at the Sverdlovsk telegraph office].

At the present time all communications in the telegraph office have been automated. Oblast-wide communication services have been equipped with the CT-35 apparatus. A direct reception of telegrams by telephone on a perforated tape has been introduced. All communications mains have been equipped for operation without printed transmission control. This freed 36 apparatuses, which are now utilized for organizing new communications. The concentration of city and oblast-wide communications with small loads has been completed and resulted in many economies. The circuits and structural design of concentrators were developed by efficiency experts of the Sverdlovsk telegraph office.

Over 50 non-relay COPC bays were established in telegraph communications which also resulted in some economies. To facilitate the servicing of the CT-35 apparatus and to reduce noise, all these units are covered with transparent plexiglass hoods. Devices enabling the checking of national, city, and oblast-wide communications without interrupting their operation have been developed and introduced. Similar devices have been established on the monitoring and information services and also in the instrument rooms.

To improve the efficiency of telegraph operators in rayon centers, the telegraph office laboratory developed and produced small-capacity concentrators, which have been installed in six rayon communication offices.

The employees of the line equipment room (ЛЛ3) increased the capacity of one 18-channel system to 24 channels.

Among developments planned for the future is the introduction of "avia," a scheme of electric through telegrams. Two new systems of code conversion are being tested.

I. I. Yatsevichyus [Chief engineer of the Vil'nyus long-distance office].

The introduction of semiautomatic long-distance telephone communications in the Vil'nyus office started in 1954. The project of the first stage of automation was ready in 1959 and in 1959-1960 a substantial amount of work was accomplished. In five largest cities of the Lithuanian SSR long-distance telephone offices, each having connections with 10 to 15 rayon central offices have been established. These offices are connected by long-line channels of automatic communication with two-frequency apparatus, while the rayon central offices are connected with them by channels operating with simplified single-frequency apparatus.

With this structure of the communications system, automatic through connection between any points equipped with semiautomatic apparatus is possible, while fully automatic long-distance telephone communication between the basic toll centers can be established in the near future.

The Vil'nyus long-distance office has at present 111 channels set up for semiautomatic operation. Automatic through operation is being organized along all the semiautomatic input channels in eight directions.

Single-frequency simplified semiautomatic apparatus has been installed in 40 rayon central offices and three intercity centers. In general, 70% of the incoming traffic goes through semiautomatic channels. This has resulted in economies in personnel and has increased the efficiency of telephone operators and the efficiency of channel utilization.

In 1961 the switching of 50 channels for semiautomatic operation with two-frequency apparatus and of 20 channels for single-frequency simplified apparatus was planned. The central office was to be equipped for automatic direct dialing in 40 directions. The technical personnel of the station were to build an automatic device for the calculation of telephone call prices and to introduce fully automatic communication between Vil'nyus and the cities of Kaunas and Klaypeda.

In connection with large-scale automation of local telephone networks, a changeover in the rayons of the Lithuanian SSR of communication channels with rayon dial offices to semiautomatic service is foreseen. The semiautomatic equipment dismantled at the Vil'nyus office will be used for this purpose.

A. K. Solov'yev [Senior engineer of the Kirov office]

In 1957-1958 the Kirov telegraph office was entirely re-equipped for automatic processing of telegrams, which resulted in some economies and in a 36% rise in work productivity. Before that time, up to 30% of the communication offices were working with Morse apparatus, and it was necessary to transfer them quickly to CT-35 apparatus, which was done before the end of 1959.

The Kirov office has successfully adopted the Leningrad telegraph office method for operation without printed control of transmission, with a resultant decrease in costs. Savings were also obtained by establishing concentrators in town and oblast-wide communications. Tuning quality was improved by the use of DMC devices (electronic distortion meters).

At the Kirov station the method of group servicing of communications is applied. A wider introduction of this method is hindered by the presence of different types of equipment; i.e., Baudot and CT-35.

A. V. Fedorychev [Efficiency expert of the Gor'kiy office]

The Gor'kiy office processes 97% of all telegrams automatically. All duplex telegraph communications which were equipped with CTA (start-stop) apparatus, have been changed over for operation without printed control of transmission. The use of new multiplexing equipment created conditions for a more complete utilization of telephone circuits and for the improvement of stability of not only the main, but also the oblast-wide telegraph communications, as for example, links with Arzamas, Dzerzhinsk, and Pavlovo.

- 3) Malakhiyev, A. M. We improve service to agricultural workers. Vestnik svyazi, no. 1, Jan 1961, 19-20.

The quickest possible "radiofication" of the rural areas is considered to be the most important task in communications development in Stavropol'skiy kray. Three rayons, Apanasenkovskiy, Mineralovodskiy and Prikumskiy, have already become rayons of "solid" radiofication. Soon solid radiofication will be completed in 12 more rayons. A total of over 80% of all inhabited places in the territory are already "radiofied." There are 25 "radio points" per 100 inhabitants.

During 1960 it is planned to "radiofy" 14,500 dwellings, of which 10,000 are in rural areas; to build or redesign some 20 rediffusion stations ("radio-knots"); and to build 1200 km of overhead and underground lines. Already in 1960 the inhabitants of such remote places as Uchkulan, in the mountains of the Caucasus Range, the hamlets of Krym, Pristan', and Frolovskiy in the Karachayevo-Cherkesskaya avtonomnaya oblast', and others, could receive radio broadcasts.

Eighteen sets of the newest equipment have been installed in the radiodiffusion centers of the Ministry of Communications. Underground cables with polyvinyl chloride sheaths are widely used; since there are no forests and wood is scarce in the kray, such cables greatly cheapen the construction and operation of electric lines. The cable lines are laid with mechanized equipment.

In 90 rural electrocommunications offices, joint servicing of radiofication and communications was organized, resulting in savings.

A great improvement in work efficiency was obtained by transferring sovkhos radio rediffusion stations to the management of the Ministry of Communications. In 1961 all 100 rediffusion stations of the kray were to be under the management of the kray's Communications Administration.

To improve the telephone communications of the sovkhoses, 45 r-f radio sets have been installed in rural areas with the aim of multiplexing the BPC (the rayon-wide communications service): 27 rayon telephone offices with manual operation have been replaced by dial rayon-wide offices, and 42 VHTC (semiautomatic telephone systems) have been established. Multiplexing equipment of the BC-3 system began to appear in the rayon-wide communication networks in 1960. Also in that year 1110 km of conductors were suspended between the centers of the rayon-wide communications services, which improved communications with 10 junction centers; six communication sections were equipped with telephones; 4 dial offices for rayon-wide communications service were mounted; and 10 VHTC repeater stations for the telecommunications system were established.

In the Mineralovodskiy rayon progress was made toward the elimination of single-wire individual lines in the rayon-wide communications system, the construction of two BPC dial offices and of one VHTC.

Television relay stations were established in Stavropol', Kislovodsk, and Cherkessk. The equipping of relay stations is near completion in Nevinnomyssk and in the most distant point, in the settlement Zatrechniy of the Achikulakskiy rayon.

- 4) Bronner, B. V., and L. Ya. Rivin. Pattern of the new. Vestnik svyazi, no. 1, Jan 1961, 21-26.

In 1960 the Central Telegraph Office of the USSR, utilizing its own personnel, installed and put in operation a new automatic station of telegraph exchange for international communications. This made possible an increase in the number of subscribers and a considerable improvement in service. The facsimile department was rebuilt and moved to a new location. It has been equipped with the new "NEVA" and ФТАП apparatus, both Soviet-made.

The transfer of all main duplex communications and of more than 60 links with city divisions and points in the Moscow Oblast into a transmission system without printed control was completed. This freed 273 pieces of telegraph apparatus and made possible a number of economies.

A large quantity of new equipment was introduced in 1960, including devices for automatic checking of channels, voice-frequency telegraph equipment with semiconductor components, new facsimile equipment, etc.

All telegraph equipment has been provided with automatic devices and in practice all telegrams are processed automatically. In addition, all processes of outgoing connections of the telegraph exchange are automated.

Internal transportation of telegrams was entirely mechanized. The laboratory of the Central Telegraph Office and TsNIIS [the Central Scientific Research Institute of Communications] have jointly developed a system of additional multiplexing of the 16-channel TT-12/16 equipment to 24 channels.

In 1960 the technical personnel of the Office developed an electronic device for checking telegraph relays, a converter of five-unit code, and other devices.

An indicator of signal level change in the telephone channel, developed and produced by specialists of the Central Telegraph Office, was installed at the long-distance telephone office of the town of Uzhgorod, which is on the Moscow-Prague main line.

Facsimile communications have been established with Kabul [Afghanistan] and Tirana [Albania], using equipment developed by the engineering personnel of the office. They also developed and produced fm facsimile equipment for the Bucharest Office and helped the Warsaw Central Telegraph Office with advisory information.

- 5) Khomenko, A. Kh. Let us provide good communications for rural workers. Vestnik svyazi, no. 8, Aug 1961, 15-17.

All the village Soviets and state and collective farms, as well as more than 3000 organizations in rural areas (hospitals, schools, etc.) in the Moldavian SSR have telephone communications with their rayon centers. Presently [1961], 66 dial offices and 148 semiautomatic telephone offices operate in rural areas. Seventy-three per cent of all the rural-area exchanges have been made automatic or semiautomatic. Since 1960 all rural-area exchanges operate on a 24-hr basis. In the near future it is planned to replace 23 manual telephone exchanges with dial systems, increasing the percentage of dial exchanges from 35 to 57% of all rural-area exchanges. 306,000 wire broadcasting sets, 74,000 radio receivers, and 2000 television sets are in operation; there are 16.9 broadcasting receivers for every 100 persons in a rural area.

- 6) Proskurin, I. P. Communications men of the Crimea improve the service for the health resort. Vestnik svyazi, no. 8, Aug 1961, 20-22.

Yalta has obtained additional communication channels with Moscow, Leningrad, Kiyev, and Odessa. In May 1961, a 22-channel radio-relay link between Simferopol' and Yevpatoriya was set in operation, as was a dial exchange for 1000 numbers in Yevpatoriya. Dial exchanges were installed in the Livadia (200 numbers) and Foros (100 numbers) sanatoriums. In the first quarter of the current year [1961] a subscribers' telegraph office was set in operation in Yalta.

- 7) Podkolednyy, I. A. Operation of radio relay communications. Avtomatika telemekhanika i svyaz', no. 9, Sep 1961, 30-32.

The first radio relay link on the Siberian RR, 400 km in length, was built in 1958 between Tayga-Topki-Belovo-Promyshlennaya-Novosibirsk. The PM-24 pulse-type radio-relay system, manufactured in Hungary and installed on this link, had many shortcomings; 14 engineers and technicians (Hungarian and Russian) worked to eliminate these problems. In 1959 service irregularity was 13.5% of operating time, in 1960 - 3.4%, and during 3 months of 1961, only 1.7%. An 11-channel pulse-type radio relay system is operating between Barnaul and Altayskaya. This relay system, designed by N. P. Solov'yev on the basis of the PM-24 system, was produced by the RR laboratory.

- 8) Bulygin, I. V. Setting up complex telephone service in rural localities. Vestnik svyazi, no. 9, Sep 1961, 9.

In establishing reliable complex automatic telephone service to be included in the unified single telephone system of the Soviet Union, peculiarities and distinctions of individual oblasts and rayons should be taken into account. At present all the rayon central offices of the Kiyev Oblast have direct, 24-hour telephone and telegraph communications with the oblast central office. Some of the rayon offices have more than one such channel. A semiautomatic telephone system is operating between four rayon central offices and the oblast office. By the end of 1961, another three rayon offices were to be equipped with that system and one office with fully automatic service. All rural councils (Soviets), state farms, and collective farm managements in the Kiyev Oblast have been provided with telephone facilities for some time. Out of 384 communications offices, 345 are already provided with telephones. All 93 branch offices of the rayon communications system are operating around the clock. Telegraph service between the oblast central office and those of the rayons is carried out on CT-35 sets. In local telephone offices of rayon centers the local-battery system has been replaced by that of a common battery and, in two offices, by an automatic telephone system. All inhabited localities in the Kiyev Oblast have been "radiofied," i.e., a complete wire-broadcasting network has been set up. The technical servicing of local and rayon communications networks, which should operate around the clock, is inadequate, owing to a shortage of transportation. In 1960, important measures on the development of telephone communication in rural localities were ordered by the Ministry of Communications of the USSR, but these orders were not fulfilled promptly. Also, very little was done in accomplishing the plan of intercommunication telephone service. According to the author, it is imperative to develop a unified single system of rayon communications, regardless of the departmental ownership (administration) of the communication installations.

In 1961, suburban telephone service was initiated within a radius of 30 to 40 km from Kiyev. Some nearby state farms which are in telephone communication with rayon centers will be covered by this suburban network. It was decided to organize production telephone intercommunication service first of all in those rayons of the oblast which already have automatic telephone systems and where semiautomatic service is established between the rayon and oblast centers.

- 9) Gudzovskiy, A. S. We are improving service to the population. Vestnik svyazi, no. 9, Sep 1961, 23.

A considerable amount of work on introduction of new equipment and on improvement of long distance telephone service to subscribers has been accomplished at the Minsk long-distance telephone office. As a result of putting new multiplexing systems into operation during 1960 and the first six months of 1961, the number of long-distance links has been increased to 48. The number of links with oblast centers also increased considerably and out of 24 rayon centers in the Minsk oblast, 19 are provided with 2 or more long distance links with Minsk. In 1961, two KB-12 multiplexing systems were being installed to connect Minsk with Moscow, and B-12-2 and BC-3 systems were prepared and adjusted to maintain service with oblast centers and rayons. The development of long-distance multiple trunks makes it possible to transfer some of the channels into a semiautomatic switching system. On January 1, 1957, there were eight such channels, in 1958 - 10, in 1959, - 11, in 1960 - 38, and on January 1, 1961, 74. Thus, of the total number of available channels, 5.4% had been made semiautomatic by January 1, 1957, and 31.5% by January 1, 1961. Out of 24 long-distance offices in the rayon centers of the Minsk Oblast, 18 were provided with semiautomatic service. This improvement was carried out in the period 1960-1961 and made it possible to pass through 25% of incoming traffic without the assistance of the Minsk operators. For better operation of tandem connections and to release operators from switching duties, an automatic tandem switching system was set up through the semiautomatic channels. Subscribers in the rayon centers of Belorussia where long-distance offices have been equipped with semiautomatic systems may be linked by direct dialing with all the oblast centers of the Belorussian SSR and with Riga, Vil'nyus, and Moscow. Direct subscriber's outgoing line equipment [KUIA - Iskholdyashchiy komplekt pryamogo abonenta] was developed in the laboratory of the Minsk long-distance telephone office. Customers at public telephone stations are able to dial the numbers of subscribers in all oblast centers of the Belorussian SSR and in Riga, Vil'nyus, Molodechno, and Moscow.

- 10) Semenov, N. M. Automation, telemechanics, and communications development in the period between two party congresses. Avtomatika telemekhanika i svyaz', no. 10, 1961, 1-3.

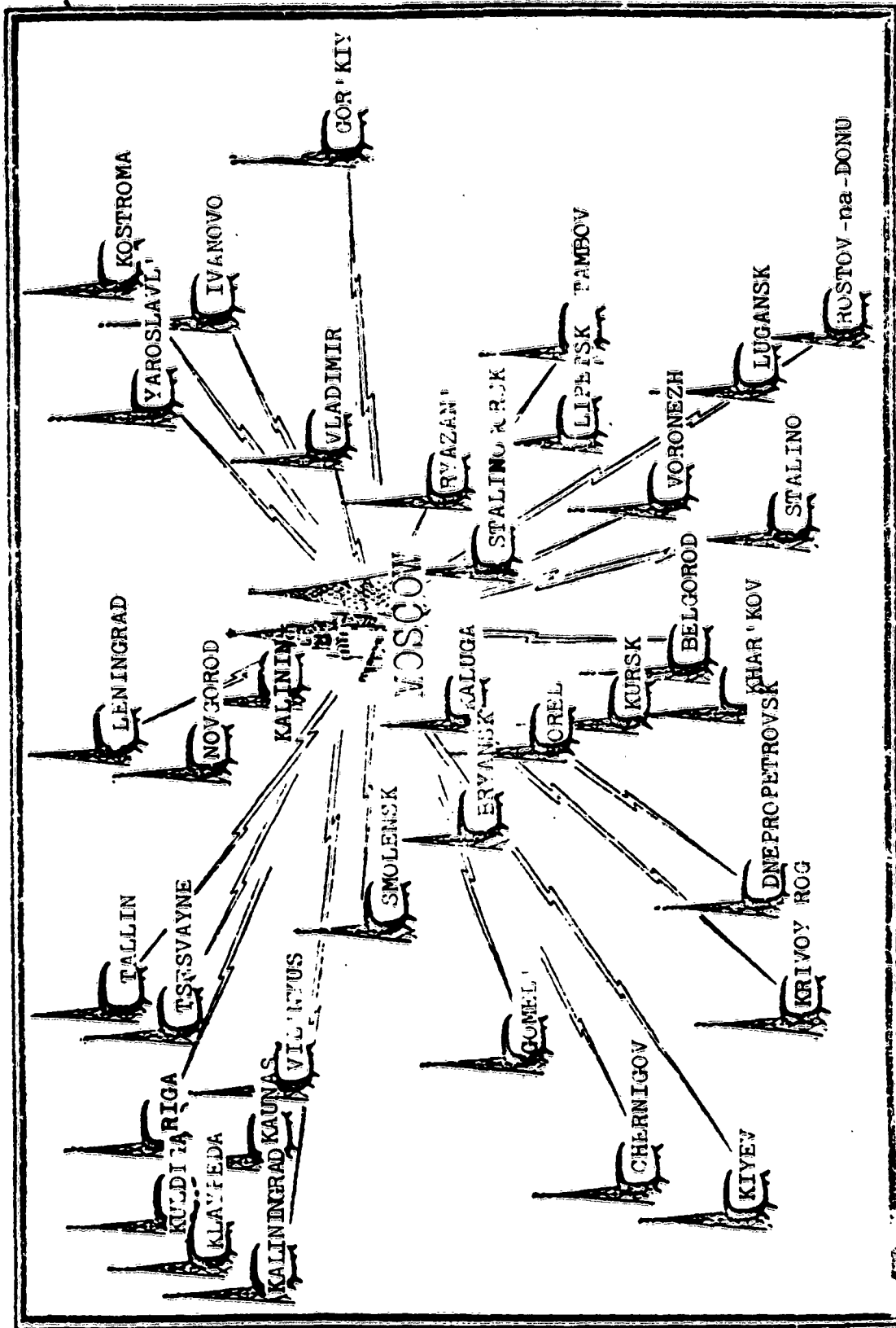
During the period between the XXth and XXIIInd Party Congresses Soviet-made 12-channel multiplexing systems were installed on the following railroad lines: Moscow-Leningrad, Moscow-Khar'kov, Moscow-Sverdlovsk-Novosibirsk-Irkutsk, Moscow-Kuybyshev-Ufa, and Moscow-Chelyabinsk-Alma-Ata. More than 300 RR divisions were equipped by 3- or 8-channel multiplexing systems. Large new dial exchanges are being built in Khabarovsk, Ural'sk, Likhobory, Perm', Tbilisi, Kaliningrad, Stalingrad [Volgograd], and Cheremkhovo. The construction of radio relay lines between Arzamas and Kazan' and Liski and Shakhtnaya was completed.

- 11) Badalov, A. On the way to technical progress. Radio, no. 10, 1961, 13-15.

The illustration on the following page shows the cities which receive television broadcasts from Moscow by means of radio relay or cable lines (Zaporozh'ye, Kokhta-Yarve, and Minsk have since been added. As of 1961, 31 million wire broadcasting sets (16 million in rural areas) and over 30 million receivers were operating in the USSR. In the near future transmission of fm broadcasts through a chain of fm stations will be widely used. In this system the main station obtains programs through radio relay or cable lines; the programs are then passed along by stations placed 120-140 km apart. These broadcasting stations will be equipped with the ИСТОК apparatus for automatic operation.

- 12) Ravish, I. S. Intersity communications today and tomorrow. Vestnik svyazi, no. 10, Oct 1961, 3-6.

The Moscow - Kiyev - L'vov telephone-television coaxial cable line has been put in operation. The sector between Moscow and Kiyev is equipped with several Soviet P-60/120 telephone systems and with the P-600 system. The proposed "Druzhba" ("Friendship") line will connect Moscow with Katowice (Warsaw), Prague, and Berlin (eastern zone). The "Druzhba" line has a number of telephone, telegraph, broadcasting, and television channels. New cables are also being laid from Moscow to the Caucasus and Tselinnyy kray and toward the Soviet Far East. This line, when completed, will be the longest in the world. Many nationwide balanced styroflex-insulated cables will be equipped with Soviet 60-channel multiplexing systems with a remote power supply of nonattended repeaters. One-quad cables equipped with K-24II and K-60II repeaters will be laid during the seven-year plan. An experimental line of this particular kind of cable has already been laid between Moscow and Zagorsk and has shown high operational stability and economy. Central (Moscow) radio and television broadcasts will, in the near future, be transmitted to the following cities: Leningrad, Kiyev, Tallin, Minsk, Smolensk, Riga, Voronezh, Vil'nyus, Khar'kov, Rostov, Stalino, Gomel', Dnepropetrovsk, Kursk, Lipetsk, Bryansk, Gor'kiy, Kaliningrad, and others. Since 1959, use of the semiautomatic long-distance telephone system has been on the increase. An experimental, fully automatic telephone system has been developed; for instance, about 40,000 subscribers of the B-1, B-3, B-8, and B-9 Moscow exchanges can now dial directly any subscribers in Leningrad.



- 13) In sunny Armenia. Vestnik svyazi, no. 10, Oct 1961, 11.

During 1960-1961, dial exchanges of 4000-number capacity in Yerevan, 1000-number capacity in Kafan, and a total of 1700-number capacity in rayon centers (Vedy, Idshevan, Shamshadim and Kalimino) were set in operation. The line construction for a dial office with 4000-number capacity in Leninakan was completed.

- 14) Nalbandyan, B. G. Some problems in the development of rural telephone communications. Vestnik svyazi, no. 10, Oct 1961, 13.

Presently, 47 rayon-wide dial exchanges and 80 semiautomatic exchanges (VNTC) operate in the rural area of Tombov Oblast. Mainly overhead lines are built for development of rural telephone networks, though the operation of these lines is not stable in rural areas and their maintenance is very expensive. Industry has not as yet produced an inexpensive underground cable especially designed for rural area telephone communications. The ППТМ cables which are produced by industry are designed for wire broadcasting and are not satisfactory as telephone cables. The use of multiplexing on rural telephone circuits is very slight, since the БУР rural-area multiplexing system, which was only recently placed in production, has a small range of operation and cannot satisfy the requirements of rayon-wide communications. The УДК-1 and К-3 multiplexing apparatuses are still in the industrial testing stage and the БС-3 multiplexing apparatus, designed for oblast-wide networks, is produced only in small quantities. Many types of rural-area dial-exchange equipment have recently been designed, but up to the present time they are still in the industrial testing stage.

- 15) Batuyev, B. K. The productivity of labor increases. Vestnik svyazi, no. 10, Oct 1961, 14.

The workers of Sverdlovsk long-distance office have completed adjustments of the 24-channel system between Sverdlovsk and Chelyabinsk, the 12-channel Verkh - Neyvinskiy system and the СДК-2 twelve-channel system to Serov and Nizhniy Tagil which opened 50 more channels, among them 26 main channels. On the average 2300 through calls are placed in the Sverdlovsk long-distance office every 24 hours.

- 16) Polyakov, G. L. Technical improvements in communication equipment. Vestnik svyazi, no. 10, Oct 1961, 15.

At present [1961] Smolensk has hf telephone communication with all rayons in the oblast. The five largest cities of Smolensk oblast have direct telephone communication with Moscow. In 1959 a Moscow - Smolensk radio relay line, equipped with the KPP-60 apparatus, and the Smolensk television retransmission station were built. The radio relay line was to be extended to Minsk in 1961. It consists of two end stations and eight repeater stations, brings Moscow television programs to the city of Smolensk and from there to the majority of the rayon centers. The first 30 telephone channels of the Moscow - Smolensk radio relay line are in testing operation. Eighteen dial exchanges and 95 semiautomatic exchanges (VNTC) have been installed on the rayon-wide network. Some 187,000 wire broadcasting sets (loudspeakers) are connected to rediffusion station networks. A 20 kw rediffusion station has been installed in the new Smolensk Central Post Office Building. At the end of the year [1961], a new telegraph station with facsimile and automatic direct-connection equipment will be finished. A two-program fm station operates in Smolensk with 163 rediffusion stations (or 74% of the total) in the good reception area; however, only 35% of these stations have fm converters. In addition to the above radio relay line, a KM-10 coaxial cable line passes through Smolensk oblast.

- 17) Marinich, A. S. Communications men of the Russian Federation - the XXII Congress of the Communist Party. Vestnik svyazi, no. 11, Nov 1961, 3-6.

The following projects were completed by the day of the opening of the Party Congress. Equipment for additional 105 telephone channels was installed in the switch room of Krasnodar long-distance office. Multichannel systems which provide additional channels between Sochi and Sukhumi, Gagry, Lazarevskaya, and Krasnodar and between Timoshevskaya and Kalininskaya and Primorsko-Akhtyrsk were set in operation. The installation of a 24-channel radio-relay system between Moscow and Shchelkovo was finished. In the Primorskiy kray, a BC-3 multiplexing system between Vladivostok and Artem, facsimile transmission between Vladivostok and Nakhodka, and voice-frequency telegraph communication between Ussuriysk and Vladivostok are in operation. The installation of the Kemerovo - Leninsk - Kuznetskiy radio relay line for the transmission of television programs to Leninsk-Kuznetskiy was completed. Nineteen city-type dial offices with a total capacity of 32,000 numbers were installed. Among them were offices in Kostroma, Novosibirsk, Moscow, Leningrad, Barnaul, Elektrostal', Sverdlovsk, Blagoveshchensk, and Elista. During only nine months of 1961, 450 telephone and 125 telegraph channels, 24 subscriber-telegraph offices, and 21 facsimile-transmission lines for oblast centers were installed.

- 18) Khristessashvili, G. A. Development of communications in Georgia. Vestnik svyazi, no. 11, Nov 1961, 6-7.

Multiplexing of existing circuits between Samtredia and Batumi, Tbilisi and Khashuri, Tbilisi and Yerevan, and Tbilisi and Gurdzhaani added 45 new long-distance telephone channels, raising the total length of long-distance in Georgia [in 1961] to 51,357 channel-km. New republic-wide voice-frequency and supersonic-frequency telegraph lines, equipped with modern Soviet-made apparatus, operate in the following links: Tbilisi - Sukhumi, Tbilisi - Batumi, Tbilisi - Kutaisi, Tbilisi - Gurdzhaani, and Tbilisi - Samtredia. In 1961 dial offices were completed in Kutaisi, Samtredia, Tskhakaya, Gali, and Tbilisi (a long-distance office). Dial offices were under construction in Batumi, Gori, Akhalkalaki, and Zestantoni. From 1959 to 1961 dial offices with a total capacity of 25,000 numbers were set in operation in Sukhumi, Zugdidi, Akhaltsikh, Gudauta, Gegechkori, Tbilisi, Gurdzhaani, Makharadze, and others. The republic has 19 radio links, among them an international link with Havana and national radio lines with Moscow, Kuybyshev, Kiyev, Terevan, Baku, Sverdlovsk, and Novosibirsk. The construction of the Tbilisi - Sukhumi - Sochi radio relay line began two years ahead of schedule. This radio relay line will allow the interchange of television programs with both Soviet and foreign cities and will considerably increase the number of telephone-telegraph channels outgoing from Tbilisi. A new 60-channel multiplexing system will be installed between Tbilisi and Gagry, with the Tbilisi - Kutaisi sector becoming operational in 1962.

As of 1961, the Georgia communication system employed 760 technicians graduated from technical schools.

- 19) Let us put into operation internal technical and economic reserves for improving service to the population. Vestnik svyazi, no. 12, 1961, 14-16.

[The article includes statements and reports presented during the conference of communication supervising and technical personnel of Lithuanian SSR in Vil'nyus.]

Soviet Lithuania possesses well-developed means of communication with excellent service to the population. General and subscribers' telegraph networks have been fully automated and all the communications establishments are connected to the direct-service automatic telegraph exchange. Modern multiplexing equipment is being installed on long-distance telephone lines; radio relay links have been organized; 53 rayons and the Polanga and Druskininkay health resorts have been provided with semiautomatic telephone systems. At the Vil'nyus long-distance office, 65% of all links have been converted to this system. Preliminary steps toward the full automation of long-distance telephone service in some directions are in process. A considerable part of the Republic is covered by television service. Private initiative of communication

personnel plays important role in searching and utilizing internal resources. For example, the personnel of the republic radio center did not wait to have a radio relay line installed, but assembled a special TV receiving point at Kaunas with the means which they had on hand. Consequently, broadcasts originating in the Vil'nyus TV center have been supplied to the Kaunas TV relay transmitter. In the period 1959-1961, the Kaunas center provided three rayon centers with automatic telephone exchanges, for at least 1000 subscribers; two more automatic exchanges, for 800 subscribers, were installed in 1961. In the field of telegraphy, a subscriber's automatic exchange was installed by the Kaunas center. Sets of the ATA-M type were provided for rayon centers (6 to 9 sets in each zone covered by a line technical center). A number of the suggestions made by the efficiency experts of the Kaunas LTC were approved and successfully put into operation. Among them were recommendations concerning the ether radio point, designed for Lithuanian farms, and the problem concerning joint operation of PПП equipment (rediffusion transmitter) and the VПTC (semiautomatic telephone system) in one circuit. Competition among "communist labor" groups has had a positive effect on work efficiency. For instance, due to the effort of the personnel at the PB-92 radio transmitter (location not given), the working life of transmitting tubes was extended by 35%.

Before conversion into the system of direct telegraph service, all the LTC centers were provided with start-stop sets and automatic equipment. Several rayon offices still have difficulties in using telegraph sets with perforated tapes and consequently to transmit telegrams they are using other than direct routes, thus introducing disorder into the traffic.

- 20) Aleksandrov, A. P. Experience of leading workers as an example for communications collectives. Vestnik svyazi, no. 12, Dec 1961, 18.

The one-year plan for increasing the number of telephone subscribers in the Latvian SSR was completed ahead of schedule, with 3000 new subscribers in local telephone exchanges and 1000 in the rayon exchanges. The completed one year plan will raise the capacity of automatic telephone exchanges up to 7000 numbers. A direct-service automatic telegraph office in Riga, a 130-km radio relay line between Tsesvoyene and Daugavpils, a TV transmitter on channel 10 (the "second program") in Riga, and a TV relay station in Daugavpils were recently put into operation. The leading technical groups competing in accomplishing the plan belong to the Riga rayon communication office and to the Rezekne line technical center (LTC), which is in charge of six enlarged rayons. The Rezekne center, using its own resources, constructed and put into operation the following communication installations. In the rayon center Dagda, an automatic tele-

phone exchange, a long distance office, a rediffusion center, and a telegraph office; in the Lilupe communications office, an automatic exchange for 300 subscribers and other assemblies. In addition to the normal duties, during the period 1960-61, more than 3000 km of wire were hung, and 26 automatic telephone exchanges of various capacity for rayon services and 22 semiautomatic telephone systems were installed, along with automatic telephone exchanges in Vilyany (300 numbers) and Ludza (700 numbers). In the city of Rezekne complete equipment for all types of communication services, including automatic telephone exchange (1000 numbers), was installed in new premises. The signallers of this rayon have completed the replacement of manual telephone exchanges with automatic systems. All the brigades of livestock-raising, collective, and state farms were provided with radio facilities and at least 5 telephone sets were installed in each.

- 21) Myand, Kh. I. We are improving telegraph service. Vestnik svyazi, no. 12, Dec 1961, 19.

The technical brigades in charge of servicing the ATA, АПС, and ТТ telegraph sets and of the distributing frame achieved excellent results in their work. In 1961, by the effort of operating personnel, new operators' equipment was installed in the instrument room. Seven switchboards for rural telegraph service and a new multiple switchboard and "no-communication" signal desk were constructed in this room. New channel systems between Tallin and Tartu and Narva were put into operation. The BT-34 voice-frequency telegraph equipment is being converted to a ЧМ system and transistorized, and the entire stock of the CT-35 telegraph sets changed for code No. 2 operation. The subscriber's telegraph network was expanded and telegraph exchanges installed in four of the rayon offices. In the Tallin telegraph exchanges all the communication services were automated.

- 22) Gusev, A. I. Development and reconstruction of means of communication in the Turkmen Republic. Vestnik svyazi, no. 12, Dec 1961, 20.

In two and a half years (in the period 1959-1961) the number of radio receiving installations in the Turkmen Republic was increased by more than 50,000; reaching a total of more than 265,000. This figure includes 117,000 in rural localities. Radio relay lines were installed in many directions. The number of telephone channels was increased considerably by putting into operation 3- and 12-channel telephone systems and other equipment. New multiplexing equipment and the laying of copper wires resulted in increasing the number of telegraph channels. Consequently, it was possible to replace obsolete Morse telegraph sets by teleprinters and to initiate the preparatory steps toward the transfer to a direct-service telegraph system. Photo-

telegraph service was opened between Ashkhabad and Moscow. In all the rayons of the Republic the local-battery telephone switchboards were replaced with central-battery equipment. Out of 340 collective farms 42 were provided with intercommunication systems. Out of 280 communication offices, 242 received telephone facilities. In the Maryysk oblast special attention was directed toward the development of rural communications service and the efficiency of operations. In cotton-raising rayons 5.5 km of new telephone lines were erected. In the Maryysk local exchange, the UB 100 x 2 common battery switchboard was put into operation.

- 23) High-quality and widespread communications for Altay workers. Vestnik svyazi, no. 1, Jan 1962, 8-10.

Five 12-channel and twelve 3-channel long-distance communication systems operate in the Altayskiy kray. In Barnaul, a 5000-number dial exchange is operating and an 1100-number exchange is presently being built. The intrarayon communications network has six radio relay stations and 66 B4P-type multiplexing systems for steel-wire lines. All collective and state farms, village Soviets, and post offices have telephone communication. In 1956, telebroadcasting was introduced in the kray.

- 24) Gerchikov, Ye. Ya., and E. L. Samolyukov. Development of subscriber's telegraph in the Ukraine. Vestnik svyazi, no. 1, Jan 1962, 21-22.

TWX service was initiated in the Ukraine soon after World War II. The first exchanges were installed in Kiyev, Kharkov, Dnepropetrovsk, Donetsk, and Odessa. In 1959, manual TWX was

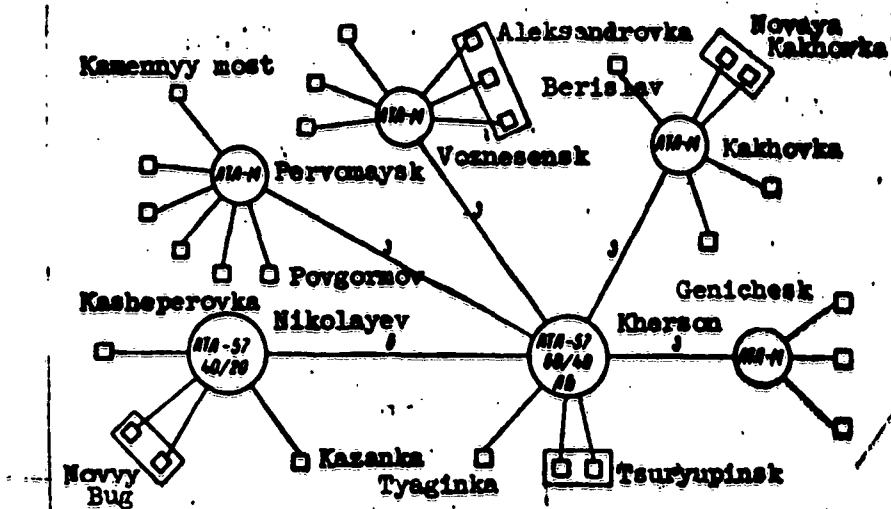


Diagram of subscriber telegraph communications network in the Kherson economic region.

introduced in all oblast centers and also in Krivoy Rog, Makeyevka, Zhdanov, and Sevastopol'. In 1961, the ATA-57 automatic TWX was installed in Kherson, Nikolayev, and Stanislavo and the ATA-M automatic TWX in Dneprodzerzhinsk, Slavyansk, and Kerch.

The following voice frequency and supersonic telegraphy lines were laid: Kiyev - Donetsk, Kherson - Nikolayev, Khar'kov - Simferopol', Kiyev - Vinnitsa, and others. Increased production of the ATA-57, ATA-M, TT4M12/47, and HT4M-4 TWX equipment favors the development of TWX service. A branched network of TWX service in various economic and administrative regions is planned. As an example, the branched network of TWX service for Kherson economic region is given in the illustration. The whole TWX network of the Republic is divided into areas which are served by junction TWX's. All these junction TWX's will be connected on the each-to-each principle.

- 25) Semenov, N. M. To fulfill successfully the fourth year of the Seven-Year Plan. *Avtomatika telemekhanika i svyaz'*, no. 2, 1962, 1-3.

In 1961 the modernization of hf telephone lines by the installation of 12-channel multiplexing systems was completed on the following RR divisions: Moscow - Smolensk, Moscow - Khar'kov, Leningrad - Petrozavodsk, Penza - Kuybyshev, Ufa - Chelyabinsk, and Irkutsk - Zima. Eight-channel multiplexing systems were installed on the following divisions: Ordzhonikidze - Baku, Sverdlovsk - Perm, and Saratov - Volgograd.

- 26) Vaysa, A. A. Automatic direct-connection TWX system in Lithuania. *Vestnik svyazi*, no. 2, Feb 1962, 14-16.

During 1958-1959, a direct-connection automatic TWX system was designed for use in Lithuania. Junction automatic TWX with direct-connection apparatus has been installed in Vil'nyus, Kaunas, Klaypeda, Shavlyay, and Panevezhis, and automatic TWX equipment in 36 rayon centers. The voice and supersonic telegraphy channels are used between the junction TWX by the each-to-each principle and between the junction TWX and the rayon TWX. At present 224 subscribers are connected to the automatic TWX and 131 telegraph offices have been equipped with direct-connection apparatus.

- 27) Petrushin, I. P. Automation and complex mechanization of long-distance telephone communications. Vestnik svyazi, no. 4, Apr 1962, 3-4.

During the past five years semiautomatic apparatus has been introduced on long-distance communication networks, and at the end of 1961, 7% of all Soviet long-distance channels were operating semiautomatically. Direct dialing was introduced between Moscow and Leningrad; the 80,000 Moscow telephone subscribers on the Б-1, Б-3, Б-8, Б-9, Д-0, Д-5, Д-7, and Г-5 exchanges can dial Leningrad numbers directly. The future prospects of intercity telephone communications include the creation of a unified automatic Soviet Union network, including long-distance, city, and rural-area communications systems. The Ministry of Communications ordered that during the Seven-Year Plan the long-distance automatic network be expanded to include the 28 largest long-distance offices, among them the Republic long-distance offices of the Ukraine, Belorussia, Kazakhstan, Uzbekistan, Latvia, Lithuania, Estonia, and Kirgizia. Beginning with 1963 such automatic long-distance networks must include the automatic registration of the calling subscriber's number. This measure will cut down the number of dialing figures from 16 to 10. At present 70% of the repeaters along the cable lines are unattended. The number of unattended repeaters between two attended ones, now set at five, must be increased to 10-12 along balanced cable lines multiplexed by 24 or 60 channels. Along K-1920 coaxial cable lines the number of these repeaters should be increased from 19 to 32. In oblast-wide communication networks 1 x 4 cables equipped with K-60 multiplexing and with nonattendent semiconductor repeaters up to 20 km apart will be widely used. On 4 x 4 cable lines equipped with K-60 multiplexing systems all repeaters will be transistorized. The automation of the long-distance network requires modern, inexpensive remote control and telemetering equipment; however, the equipment presently manufactured is complicated, expensive, unstable in operation, and is designed for use on the lines having six nonattended repeaters between two attended ones. New three-channel multiplexing systems for steel-wire lines with transistorized unattended repeaters, recently designed by industry, will be helpful for automation of rural area telephone networks.

- 28) Dial exchanges in the village. Vestnik svyazi, no. 5, May 1962, front insert.

More and more dial exchanges are being introduced in rural areas. Small capacity dial exchanges operating in the Chuchkovo rayon in Ryazan' Oblast include one for 50 subscribers in Pertovo village, one for 50 subscribers in the Nazarovka settlement, and one for 30 subscribers in the Unkosovsk communications branch office. A dial exchange for 40 users has been installed in the collective farm imeni Lenin (Ovruch rayon of Zhitomir Oblast) and is being used for intercommunication.

A dial exchange for 100 users has been completed in the Borinskoye village of the Lipetsk Oblast. Rural dial exchanges are operating in the following rayons of Lipetsk oblast: Yeletsk, Oktyabrsk, Trubetchinsk, Usman', Zadonsk, and others.

- 29) Savanchuk, V. A. On the threshold of complete "radiofication" of the Ukraine. Vestnik svyazi, no. 5, May 1962, 13-15.

By the beginning of 1954, wire broadcasting was installed only in 27% of inhabited locations, with 3,270,000 wire broadcasting sets, including 1,276,000 in rural areas. During the last 8 years, wire broadcasting was installed in 21,000 inhabited locations; this required laying 270,000 km of lines (160,000 km of cable lines). 3700 rediffusion stations are presently feeding 7.6 million wire broadcasting sets, including 4.67 million in rural areas. Five hundred of these stations are equipped with TY-5 amplifiers and 2000 stations with TY-600 amplifiers. Current problems include the introduction of remote control of rediffusion stations and transmission of broadcasting programs from oblast and rayon centers by means of telephone channels.

- 30) Lobanov, T. F. Improving the quality of service to the rural population. Vestnik svyazi, no. 5, May 1962, 18-19.

In the Bashkir ASSR new intercity telephone channels have been installed during the last year which insure 24-hour communications between Ufa (capital city of the Republic) and the rayon centers and, partially, between the rayon centers themselves. Each collective and state farm has telephone communications. All one-wire lines have been eliminated. Ten local Agriculture Boards have been organized; to meet their needs for direct communication with the rayons, new interraxon links are being set up. A total of 140 dial and semiautomatic exchanges (VNTC) are operating in rural areas. Of 72 rayon-wide trunks which have been organized, 62 use modern BC-3, PPC-1M, or VAK multiplexing systems. These trunks insure long-distance communications for all subscribers in rural areas. During the current year [1962] 25 dial exchanges will be installed in rural areas and 30% of all exchanges will be automated. Wire broadcasting sets are available in 82.4% of the collective-farm quarters.

- 31) Afanas'yev, P. V. More help for agriculture. Vestnik svyazi, no. 6, Jun. 1962, 19-21.

In Belorussia 175 rayon-wide dial exchanges, 170 semiautomatic exchanges (VNTC) and 565 manual telephone exchanges are in operation. All village soviets and state and collective farms have telephone communication with their rayon centers. The sixty Local Agriculture Boards in Belorussia require direct communication with the rayon centers in their zones of operation; using alternative trunks, direct communication has been realized for 38 boards and new lines now under construction will insure direct communication, for the other 22 by May of this year [1962]. Shortages of materials and apparatus have limited the number of lines built. In many cases there is only single-channel direct communication between a Local Agriculture Board and its rayon center. About 1,000,000 wire broadcasting and radio sets are presently in use in Belorussia.

- 32) Medvedev, Ye. S. Reliable telecommunication for the Local Agriculture Board. Vestnik svyazi, no. 7, Jul 1962, 1-3.

The government of RSFSR ordered the Ministry of Communication to insure that telephone and telegraph communications were established between each Local Agriculture Board and the state and collective farms in its zone of operation. It is known that intraoblast communications in RSFSR are built on a radial system and the numbers and capacity of rayon exchanges is small. In many oblasts and krais (Yakutskaya ASSR, Tyumen', Arkhangel'sk, Kamchatka oblasts, Krasnoyarskiy kray, etc.) only 50 to 60% of the rayon centers have 24-hour communications. A small number of state and collective farms have direct communications with rayon centers; however, many of them get the connection with rayon centers through two or three intrarayon exchanges. Some 17% of the latter have a dial system and only 54% operate on a 24-hr basis. One-wire lines are in operation in some places. Of the 452 Local Agriculture Boards operating in the RSFSR, 10 (in Magadan, Arkhangel'sk, Tyumen', the Irkutsk and Kamchatka oblasts, and Krasnoyarskiy kray) do not have 24-hour communication service with their oblast or kray center. Out of 1515 rayon centers, 1090 have 24-hour communications with their Local Agriculture Boards; 911 have direct 24-hr communications with their Boards. The following were to be accomplished in 1962: telephone sets installed in 38 Village Soviets and 136 collective and state farms; and intercommunication systems built in 800 collective and in 419 state farms. This would require the building of 20,000 km of wire lines and 27,000 km of cable lines; the installation of 800 units of the YMK multiplexing system, 60 units of the K-3 multiplexing system, 100 stations of the PPC-1 radio relay system, 25,000-30,000 telephone sets, and 3000 telephone sets for distance subscribers; and the completion of 1400 dial exchanges and 200 semiautomatic exchanges. When all this work is finished,

all but 450 collective and 24 state farms will have direct communication with their rayon centers. In 1963 copper-clad steel wire multiplexed by 3- or 12-channel systems, cable with non-metallic sheathing multiplexed by a 24-channel system, and the VDR system for rayon-wide networks will be widely used. The VDR system is the only equipment used in rural networks. The K-3 multiplexing system, only recently placed in production, can not find application owing to its inadequacies (lack of amplifier stations), its considerable limitation for use on steel wire lines, and its very high price.

- 33) Sokolov, G. A. Problems in the building and operation of radio relay lines. *Avtomatika telemekhanika i svyaz'*, no. 7, 1962, 39-40.

Five years ago the first railroad radio relay line in the USSR was put into operation between Moscow and Ryazan'. Presently, there are thousands of miles of such lines. This article deals with the experience of building and operating the PM-24A radio relay line on the Southeast RR. This line is a part of the Moscow - Rostov main link. In 1960, the radio relay line in the Michurinsk - Voronezh - Liski RR sector was put in operation, and the Liski - Shakhtnaya sector will be completed in the current year [1962]. In designing the Michurinsk - Voronezh line, the Giprotranssignalsvyaz' [State Institute of Preliminary Research and Design of Signalization and Centralization of Communications and Radio in Railroad Transportation] set up the Usman - Gryazi sector with a path of propagation beyond the horizon, and the Usman' - Voronezh sector with a path of propagation partly beyond the horizon. On these sectors, fadings produce service irregularities in 4.2% of total operating time. The Institute intends to increase the area of the upper mirrors on the towers at Usman and Gryazi when the second trunk line is built. The author feels that this measure will not improve the operation and that simply increasing the height of the tower from 70.5 m to 85.5 m will eliminate this fault.

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